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GNRO-2014/00040

May 28, 2014

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Licensee Event Report (LER) 2014-003-00 Automatic Actuation of the Reactor Protection System (RPS) due to Main Turbine Overspeed Protection Load Reject Relay Fault
Grand Gulf Nuclear Station, Unit 1
Docket No. 50-416
License No. NPF-29

Dear Sir or Madam:

Attached is Licensee Event Report (LER) 2014-003-00 which is a final report. This report is submitted in accordance with Title 10 *Code of Federal Regulations* 50.73(a)(2)(iv)(A).

This letter contains no new commitments. If you have any questions or require additional information, please contact Mr. James Nadeau at 601-437-2103.

Sincerely,

JJN/cb

Attachment: Licensee Event Report (LER) 2014-003-00

CC: (See next page)

cc: with Attachment

NRC Senior Resident Inspector
Grand Gulf Nuclear Station
Port Gibson, MS 39150

U. S. Nuclear Regulatory Commission
ATTN: Marc L. Dapas (w/2)
Regional Administrator, Region IV
1600 East Lamar Boulevard
Arlington, TX 76011-4511

U. S. Nuclear Regulatory Commission
ATTN: Mr. Alan Wang, NRR/DORL (w/2)
Mail Stop OWFN 8 B1
Washington, DC 20555-0001

Attachment to

GNRO-2014/00040

Licensee Event Report (LER) 2014-003-00

NRC FORM 366 (01-2014) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 01/31/2017

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Grand Gulf Nuclear Station, Unit 1	05000 416	1 OF 4

4. TITLE

Automatic Actuation of the Reactor Protection System due to Load Reject Relay Fault

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
03	29	2014	2014	- 003 -	00	05	28	2014	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE

1

10. POWER LEVEL

087%

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
James J Nadeau / Manager, Regulatory Assurance	601-437-2103

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
E	TA	CAP	S188	N					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On March 29, 2014, at 10:08 Central Daylight Time with the plant at 87 percent rated core thermal power, Grand Gulf Nuclear Station experienced an automatic actuation of the reactor protection system and plant scram due to a Main Turbine Overspeed Protection Load Reject Relay (LRR) fault. All control rods fully inserted and safety systems operated as designed. No safety relief valves lifted and no isolation signals were received. Reactor Water Level increased, resulting in a Level 9 SCRAM signal which caused an automatic trip of both reactor feed pumps to reduce reactor water inventory. However, reactor feedwater was promptly restored. The cause of the event was an L-RR fault which caused a fast closure signal to the Main Turbine Control Valves (TCV). The TCV closure resulted in the automatic actuation of the reactor protection system and plant scram. Investigations determined the cause of the LRR fault was a failed ceramic capacitor on a Multiplier Module (MM) card. The failed MM card has been replaced as well as the LRR power supply, power measurement input module and voltage measurement input module. The event posed no threat to public health and safety.

NARRATIVE

A. INITIAL CONDITIONS

At the time of the event, Grand Gulf Nuclear Generating Station (GGNS) Unit 1 was operating at 87 percent rated core thermal power. All systems, structures or components that were needed to mitigate, reduce the consequences of, or limit the safety implications of the event were available.

B. DESCRIPTION OF EVENT

On March 29, 2014, at 10:08 Central Daylight Time with the plant at 87 percent rated core thermal power, Grand Gulf Nuclear Station experienced a Main Turbine Overspeed Protection Load Reject Relay (LRR) [RLY] fault resulting in an automatic actuation of the Reactor Protection System (RPS) [JC] and plant scram. The main turbine LRR actuated causing the four main turbine control valves (TCV) [SCV] to close momentarily. The LRR actuated four times in only a few seconds, indicating that the Siemens Multiplier Module (MM) card failed four times, followed by catastrophic random failure of a ceramic capacitor on the MM card. Actuation of the LRR due to the failed capacitor on the MM card caused the load reject solenoids to energize and the TCVs to receive a fast closure signal.

The LRR is part of the Main Turbine Overspeed Protection [XC] scheme and is designed to respond to load rejection events on the transmission system. The LRR is designed to anticipate an overspeed condition and generate a turbine trip before the Electro-Hydraulic Converter (E/H C) [CNV] speed control and Mechanical Hydraulic Speed Setter [HCU] respond to limit overspeed in order to reduce turbine steam flow when generator power cannot be transmitted.

The dispatcher confirmed there were no substantial grid disturbances that caused the GGNS plant SCRAM. Therefore, a valid load reject event was ruled out as the cause of the LRR sequential actuation. Investigation determined the LRR actuated multiple times after the initial actuation. As designed, the LRR would actuate only once for a valid event. Visual inspection identified a catastrophically failed capacitor on the MM card 7TL4610. The LRR could not be calibrated with the as-found module. The MM was replaced and the unit was successfully calibrated. The ceramic capacitor randomly failed resulting in a sequence of events that inadvertently actuated the LRR and a subsequent plant SCRAM. The LRR Converter (power supply), power measurement input and voltage measurement input modules were replaced as a proactive measure to minimize risk.

C. EVENT CAUSE

The cause of the automatic reactor shutdown was closure of the TCVs caused by sequential actuation of the LRR due to an age-related failure of a capacitor on the LRR MM card (manufacturer – Siemens). The preliminary cause of the age-related capacitor failure is failure to track implementation of identified and required corrective actions from the developed Single Point Vulnerability (SPV) mitigation strategy and apparent cause analysis and to complete the procurement evaluation in order to find a replacement LRR or rebuild the original. Additional investigation is planned through evaluation of vendor analysis to validate the failure mode.

D. CORRECTIVE ACTIONS

The MM card has been replaced. In addition, the LRR power supply, power measurement input module and voltage measurement input module were also replaced.

A design change is planned to replace the LRR with a modern relay such that no single component failure would cause an incorrect operation or prevent a valid operation.

E. SAFETY SIGNIFICANCE DETERMINTAION

The event posed no threat to public health and safety as the RPS performed as designed. All safety systems responded as designed. There were no significant complications during the scram and recovery.

At no time during the event were any technical specification safety limits violated or challenged. There were no Emergency Core Cooling (ECC) [BN] System actuations or malfunctions. The End Of Cycle/Recirculation Pump Trip (EOC/RPT) [IT] system initiated, as designed, to transfer both reactor recirculation pumps to slow speed due to closure of the main TCVs. The main generator output breakers opened approximately 1 minute and 10 seconds after the event. The condition described would not have prevented automatic actions from occurring that protect the integrity of the reactor core and vessel.

Immediate actions performed by the Operations staff were adequate and appropriate in maintaining the reactor in a safe shutdown condition. Reactor Water Level increased, resulting in a Level 9 SCRAM signal which caused an automatic trip of both reactor feed pumps to reduce reactor water inventory. However, reactor feedwater was promptly restored.

Radiological safety was not affected since there was no radiological release to the public during the event. Industrial safety was not affected.

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NARRATIVE

F. BASIS FOR REPORTABILITY

This Licensee Event Report (LER) is being submitted pursuant to Title 10 Code of Federal Regulations (10 CFR) 50.73(a)(2)(iv)(A) for an automatic actuation of the Reactor Protection System. Telephonic notification was made to the U.S. Nuclear Regulatory Commission (NRC) Emergency Notification System (ENS) on March 29, 2014, within 4 hours of the event, pursuant to 10 CFR 50.72(b)(2)(iv)(B) for the RPS actuation.

G. ADDITIONAL INFORMATION

The LRR was replaced in 2005 under a twelve year replacement preventive maintenance strategy using a non-refurbished spare from Unit 2. The LRR power supply card failed in October, 2008, and again in July, 2009.

In 2007, SPV mitigation strategies were developed to address age-related components associated with the LRR. Corrective actions issued in 2008 to replace the LRR with refurbished parts were not performed. Long term resolution to eliminate the LRR as an SPV component by implementing Turbine Control upgrade modifications were not performed.

The LRR that failed during the March 29, 2014 event was previously satisfactorily calibrated in May, 2012.

Energy Industry Identification System (EIIS) codes and component codes are identified in the text of this report as [XX].